

Corrections on SOME INSIGHTS ABOUT THE SMALL BALL PROBABILITY FACTORIZATION FOR HILBERT RANDOM ELEMENTS

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1. In defining the residual term $\mathcal{R}(x, \varepsilon, d)$ in equation (3.1) (and (3.5) in the Supplementary materials), the mean is conditioned to (x_1, \dots, x_d) as follows:

$$\mathcal{R}(x, \varepsilon, d) = \mathbb{E} \left[(1 - S)^{d/2} \mathbb{I}_{\{S \leq 1\}} \middle| (x_1, \dots, x_d) \right].$$

This new definition leaves true all the remaining statements in the paper; in particular, the min-max Courant-Fisher principle guarantees that Lemma 1 (in the Supplementary Materials) and Proposition 1 hold true.

2. In the proof of Theorem 1 (in the Supplementary materials), the following modifications have to be made:
 - The density $f_d(\cdot)$ which appears at the top of page 2 (in lines 1, 3 and 6) is the conditional density $f_{d|s}(\cdot)$ to $S = s$;
 - The first two equations at the top of page 3 have to be modified as follows:

$$\begin{aligned} & \left| \frac{\int_0^1 (\varphi(s|x, \varepsilon, d) - f(x_1, \dots, x_d)I) dG(s)}{\int_0^1 f(x_1, \dots, x_d)IdG(s)} \right| \leq \\ & \leq \left| \frac{\varepsilon^2 C_2 \int_0^1 f(x_1, \dots, x_d)IdG(s)}{2\lambda_d \int_0^1 f(x_1, \dots, x_d)IdG(s)} \right| = C_2 \frac{\varepsilon^2}{2\lambda_d} \end{aligned}$$

and, supposing that S has positive density over $(0, 1)$,

$$\begin{aligned} \int_0^1 f_{d|s}(x_1, \dots, x_d)I(s, \varepsilon, d)dG(s) &= f_d(x_1, \dots, x_d) \int_0^1 I(s, \varepsilon, d)f_{S|d}(s)ds \\ &= \frac{\varepsilon^d \pi^{d/2}}{\Gamma(d/2 + 1)} \mathbb{E} \left[(1 - S)^{d/2} \mathbb{I}_{\{S \leq 1\}} \middle| (x_1, \dots, x_d) \right] \end{aligned}$$

where $f_{S|d}(s)$ is the conditional density of S to $(\theta_1, \dots, \theta_d) = (x_1, \dots, x_d)$.

3. The right hand side of Equation (5.3) must be multiplied by 2.